

Matthew K. Brachmann

PhD Candidate

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Education

BSc with specialization in ecology, 2015

*Graduated with distinction (GPA \geq 3.7)

University of Alberta, Edmonton, Canada

PhD Integrative Biology, 2015 - present

University of Guelph, Guelph, Canada

Publications

Peer Reviewed

Fisher, D., **Brachmann, M.**, & Burant, J. B. 2018. Complex dynamics and the development of behavioural individuality. *Animal behaviour*, 138, e1-e6. DOI: 10.1016/j.anbehav.2018.02.015.

Nugent, C. M., Leong, J. S., Christensen, K. A., Rondeau, E. B., **Brachmann, M. K.**, Easton, A. A., Ouellet-Fagg, C. L., Crown, M. T. T., Davidson, W. S., Koop, B. F., Danzmann, R. G., Ferguson, M. M. 2019. Design and characterization of an 87K SNP genotyping array for Arctic charr (*Salvelinus alpinus*). *PLoS ONE*, 14(4), e0215008. DOI: 10.1371/journal.pone.0215008.

In Review

Brachmann, M. K., Parsons, K., Skúlason, S., Ferguson, M. M. *In Review*. Parallel patterns of divergence are enhanced by allometry: a case study using sympatric Icelandic Arctic charr (*Salvelinus alpinus*). *Journal of Evolutionary Biology*.

Brachmann, M. K., Parsons, K., Skúlason, S., Ferguson, M. M. *In Review*. Evidence that niche availability, performance trade-offs, and reduced gene flow promoted repeated

patterns of sympatric diversification in Icelandic Arctic charr (*Salvelinus alpinus*). *Ecology and Evolution*.

In Preparation

Kess, T., **Brachmann, M. K.**, & Boulding, E. G. *In preparation*. Ecology shapes developmental biases and genomic architecture among loci associated with shell shape and ornamentation divergence between wave and crab ecotypes of Spanish *Littorina saxatilis*. *Journal of Evolutionary Biology*.

Awards

Alexander Rutherford Scholarship.
Government of Alberta, \$1900 CAD.

Other contributions

Brachmann, M. K., Parsons, K., Skúlason, S., Ferguson, M. M. 2019. Ecological opportunity promotes diversifying selection and facilitates rapid phenotypic divergence in Icelandic Arctic charr. Poster presentation. *European Society for Evolutionary Biology*. Turku, Finland. DOI: 10.6084/m9.figshare.9640496.v2.

Brachmann, M. K. 2019. Demystifying GitHub. Oral presentation. *University of Guelphs R users group*. Guelph, Canada.

Brachmann M. K. 2019. Tips and tricks in R. Oral presentation. *University of Guelphs R users group*. Guelph, Canada.

Brachmann, M. K., Parsons, K., Skúlason, S., Ferguson, M. M. 2018. Parallelism of morphological and ecological divergence in Icelandic Arctic charr. Oral presentation. *Canadian Society for Ecology and Evolution*. Guelph, Canada.

Brachmann, M. K., Parsons, K., Skúlason, S., Ferguson, M. M. 2018. Parallelism of morphological and ecological divergence in Icelandic Arctic charr. Oral presentation. *Charr conference*. Duluth, USA.

Brachmann, M. K. 2018. The evolution of morphological divergence in Icelandic Arctic charr (*Salvelinus alpinus*). Oral presentation. *Graduate Student Symposium*. Guelph, Canada.

Brachmann, M. K. 2018. How parallel is parallel evolution? A discussion. Oral presentation/discussion. *The Evelyn Pielou Discussion Group*. Guelph, Canada.

Brachmann, M. K. 2018. Tips and Tricks in R. Oral presentation. *University of Guelphs R users group*. Guelph, Canada.

Brachmann, M. K. 2018. An introduction to using GitHub. Oral presentation. *University of Guelphs R users group*. Guelph, Canada.

- Brachmann, M. K.** 2018. Applying dplyr and ggplot2 functions to an example data set. Oral presentation. *University of Guelphs R users group*. Guelph, Canada
- Brachmann, M. K.**, Parsons, K., Skúlason, S., Ferguson, M. M. 2017. The evolution of morphological divergence in Icelandic Arctic charr. Oral presentation. *Canadian Society for Ecology and Evolution*. Victoria, Canada.
- Brachmann, M. K.**, Parsons, K., Skúlason, S., Ferguson, M. M. 2017. The evolution of morphological divergence in Icelandic Arctic charr. Oral presentation. *Graduate Student Symposium*. Guelph, Canada.
- Brachmann, M. K.** 2017. The evolution of morphological divergence in Icelandic Arctic charr (*Salvelinus alpinus*). Oral presentation. *Graduate Student Seminar Series*. Guelph, Canada.
- Brachmann, M. K.**, Parsons, K., Skúlason, S., Ferguson, M. M. 2016. Repeated morphological, ecological, and genetic divergence. Oral presentation. *Graduate Student Seminar*. Guelph, Canada.
- Brachmann, M. K.**, Parsons, K., Skúlason, S., Ferguson, M. M. 2015. A test of parallelism in the axes of morphological and ecological divergence in Arctic charr. Poster presentation. *National Icelandic Biology Conference*. Reykjavík, Iceland.
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Experience

PhD candidate, *Ferguson lab* (2015 – Present)

University of Guelph, Canada

Responsibilities included:

- Worked on my thesis, entitled '*The evolution of Icelandic Arctic charr*', which investigates the evolutionary factors promoting and constraining biological diversity in Icelandic Arctic charr.
- Conducted field work in Iceland, from July – December 2015, which involved gill netting and lethal sampling of Arctic charr from multiple populations. I was also involved in making multiple morph specific male x female crosses in the field.
- Quantified Phenotypic variation in body shape and size for various benthic and pelagic Arctic charr morphs using landmark based geometric morphometrics.
- Assessed the degree of divergence in resource use of Arctic charr morphs using stable carbon 13 and nitrogen 15 isotopic ratios.
- Aided in the design and characterization of an 87K SNP chip.
- Lab work: Isolated DNA, determined the quality and quantity of DNA using a Nanodrop and Qbit, PCR amplification for a microsatellite multiplex, ran multiple agarose and acrylamide gels.
- Assessed the degree and nature of genomic divergence between benthic and pelagic morphs of Icelandic Arctic charr using an 87K SNP chip. I have experience with

population genetic and genomic analyses to determine population structure as well as determining areas of the genome under selection.

- I am familiar with R, UNIX, and python (to a limited degree). I have coded in all languages and environments throughout my PhD.

Research assistant, *Ferguson lab* (2015)

University of Guelph, Canada

Responsibilities included:

- Assisted with general lab work for multiple students to help prepare for several experiments.
- Assisted with the rearing of Arctic charr in an aquaculture environment which included taking length and weight measurements for thousands of fish.
- Assisted with PIT tagging of individual fish, taking fin clips of the adipose fin, and the lethal sampling of fish at the end of the experiment.

Research assistant, *The Spence lab* (2014)

University of Alberta, Canada

Responsibilities included:

- Pitfall trapped a non-native carabid beetle species, *Pterostichus melanarius*, on a 1200 x 250-meter trapping grid to assess the range expansion of the species at a field site at George Lake, Alberta.
- Aided in data collection for a post-doc (Colin Bergeron) for a project assessing biodiversity on green-roofs across Edmonton, Alberta (Bergeron, Pinzon, & Spence. 2018. Carabid and spider population dynamics on urban green roofs. *Zoosymposia*, 12, 069-089).
- Aided in setting up multiple experiments for the lab and data collection for MSc and PhD candidates.
- Worked alone and in teams for most experiments going on in the lab at the time.
- Morphologically identified various arthropod species down to family and some to genus and species levels.

Paleontological technician, *The Royal Tyrrell Museum* (2012)

Drumheller, Canada

Responsibilities included:

- Prepared various Late Cretaceous fossils for museums collections.
 - Communicated geological and paleontological information to tourists and museum visitors.
 - Completed a variety of field work in a semi-arid environment where we identified, extracted, and transported new fossils for museum collections.
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Technical training

Beyond the Books mental health awareness (2017)
University of Guelph, Canada

Worker Health and Safety Awareness Training (2016)
University of Guelph, Canada

WHIS (2015)
University of Guelph, Canada

Professional organization – Memberships

Canadian Society for Ecology and Evolution (2017 - 2019)

European Society for Evolutionary Biology (2019 - Present)

Professional service

University of Guelph R users group (UGRU). 2018-present. Member of the UGRU coordinating team. Responsibilities included:

- Planning content (tutorials and workshops) for each semester.
- Scheduling all tutorials and workshops for each semester
- Running the UGRU twitter account
- Running the UGRU GitHub page

Member of the CSEE organizing committee. 2018. I was a member of the workshop and program committees for the 2018 CSEE conference. Responsibilities included:

- Scheduling and planning numerous workshops and events for the 2018 conference.
- Making the conference schedule and program.

Reviewed for *BMC Evolutionary Biology* in collaboration with my advisor (Dr. Moira Ferguson).

Reviewed for *Evolutionary Biology (EVOL)*

Teaching experience

Lecture

ZOO*4910 – Integrative Vertebrate Diversity.
Guest lecturer, *University of Guelph*

Mentoring

Undergraduate Mentorship Program (iBUMP)
Fall semester 2017 – Winter semester 2019
University of Guelph

Teaching

BIOL*1070 – Discovering Biodiversity (W19).

Teaching assistant, *University of Guelph*

BIOL*3450 – Introduction to Aquatic Environments (F18).

Teaching assistant, *University of Guelph*

STAT*2230 – Biostatistics for Integrative Biology (W18).

Teaching assistant, *University of Guelph*

BIOL*2400 – Evolution (F17).

Teaching assistant, *University of Guelph*

ZOO*2700 – Invertebrate Morphology & Evolution (W17).

Teaching assistant, *University of Guelph*

BIOL*3450 – Introduction to Aquatic Environments (F16).

Teaching assistant, *University of Guelph*

BIOL*1070 – Discovering Biodiversity (W16).

Teaching assistant, *University of Guelph*